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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,758	01/15/2004	Luc Van Autryve	AMAT/8764.P1/FEP/OXD/JW	6404

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EXAMINER

LEE, HSIEN MING

ART UNIT	PAPER NUMBER
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2823

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/04/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/758,758

Applicant(s)

AUTRYVE ET AL.

Examiner

Hsien-ming Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18, 28-33 and 35-46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-18 is/are allowed.
- 6) ☒ Claim(s) 1-5, 28-31, 37, 42 and 43 is/are rejected.
- 7) ☒ Claim(s) 6-8, 32, 33, 35, 36, 38-41 and 44-46 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1/15/2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

HSIEN-MING LEE
PRIMARY EXAMINER

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 28, 29 and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Friedmann et al. (US 6,103,305).

In re claim 28, even though product-by-process claim is limited by and defined by the process, determination of patentability is based on the **product** itself. The patentability of a product does **not** depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

In re claim 28, Friedmann et al. teach a substrate comprising silicon (Fig. 11A), process by a method comprising:

- depositing a layer 30 comprising amorphous carbon (i.e. a-tC film) on the silicon substrate (col. 10, line 66 through col. 11, line 1); and then
- exposing the silicon substrate to electromagnetic radiation (i.e. a laser, col. 13, line 29) under conditions sufficient to heat the layer to a temperature of at least about 300°C (i.e. no more than 600 °C, col. 13, lines 26-27).

In re claim 29, Friedmann et al. teach laser annealing the substrate (col. 13, line 29).

In re claim 37, Friedmann et al. teach a method of processing a substrate comprising silicon (Fig. 11A), comprising:

- depositing a layer 30 comprising amorphous carbon (i.e. a-tC film) on the silicon substrate (col. 10, line 66 through col. 11, line 1); and then
- exposing the silicon substrate to pulses of electromagnetic radiation (i.e. a laser, col. 13, line 29) under conditions sufficient to heat the layer to a temperature of at least about 300°C (i.e. no more than 600 °C, col. 13, lines 26-27).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friedmann et al. (US ' 305) in view of Chou et al. (US 2002/0055012).

In re claim 1, Friedmann et al. teach a method of processing a substrate comprising silicon (Fig. 11A), comprising:

- depositing a layer 30 comprising amorphous carbon (i.e. a-tC film) on the silicon substrate (col. 10, line 66 through col. 11, line 1); and then
- exposing the silicon substrate to electromagnetic radiation (i.e. a laser, col. 13, line 29) under conditions sufficient to heat the layer to a temperature of at least about 300°C (i.e. no more than 600 °C, col. 13, lines 26-27).

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Friedmann et al. is silent as to the wavelength of the laser being between about 600 nm and 1,000 nm.

Chou et al., in an analogous art, teach heating by annealing the amorphous carbon by exposing to electromagnetic radiation (i.e. a laser beam, paragraph, [0024], line 13) having a wavelength 660 nm (paragraph [0024], line 16).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to heat the amorphous carbon using laser as taught by Friedmann et al. with a wavelength of 660 nm, as suggested by Chou et al., since by this manner it would successfully anneal the amorphous carbon.

In re claim 2, Friedmann et al. teach laser annealing the substrate (col. 13, line 29).

In re claim 5, Chou et al. remedy the deficiency in Friedmann et al. because Chou et al. teach that the amorphous carbon is deposited by plasma enhanced chemical vapor deposition (paragraph [0017]).

5. Claims 30, 31, 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friedmann et al. (US ' 305) in view of Hayashi et al. (US 5,599,590, submitted by applicants).

In re claim 30, Friedmann et al. teach using laser annealing but fail to teach that the laser annealing comprises focus continuous wave electromagnetic radiation into a line extending across a surface of the substrate.

Hayashi et al. teach that the laser annealing comprises focusing continuous wave electromagnetic radiation into a line extending across a surface of the substrate (col. 5, lines 9-10).

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Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to laser anneal the amorphous carbon of Friedmann et al. with continuous wave electromagnetic radiation, as taught by Hayashi et al., since by this manner it would successfully anneal the amorphous carbon.

In re claim 31, Hayashi et al. remedy the deficiency of Friedmann et al. because Hayashi et al. teach that electromagnetic radiation is provided by a lamp (col. 4, lines 48-50).

In re claim 42, Friedmann et al. teach a method of processing a substrate comprising silicon (Fig. 11A), comprising:

- depositing a layer 30 comprising amorphous carbon (i.e. a-tC film) on the silicon substrate (col. 10, line 66 through col. 11, line 1); and then
- exposing the silicon substrate to electromagnetic radiation (i.e. a laser, col. 13, line 29) under conditions sufficient to heat the layer to a temperature of at least about 300°C (i.e. no more than 600 °C, col. 13, lines 26-27).

Friedmann et al. do not teach that the electromagnetic radiation is provided by a lamp.

However, using the lamp as the source of electromagnetic radiation for treating the amorphous carbon has been widely used in the art, as evidenced by Hayashi et al. (col. 4, lines 48-50).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to anneal the amorphous carbon using the lamp, as taught by Hayashi et al., instead of using laser as in Friedmann et al.. since the lamp is an art recognized equivalence to the laser as the source of electromagnetic radiation.

In re claim 43, the selection of the lamp is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). In other word, as long as the lamp is capable of producing electromagnetic radiation it can be used for the specific purpose as claimed.

6. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friedmann et al. (US '305) in view of Chou et al. (US '012) as applied to claims 1 and 2 above, and further in view of Hayashi et al. (US '590).

In re claim 3, Friedmann et al. in view of Chou et al. teach using laser annealing but fail to teach that the laser annealing comprises focus continuous wave electromagnetic radiation into a line extending across a surface of the substrate.

Hayashi et al. teach that the laser annealing comprises focusing continuous wave electromagnetic radiation into a line extending across a surface of the substrate (col. 5, lines 9-10).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to laser anneal the amorphous carbon of Friedmann et al. in view of Chou et al. with continuous wave electromagnetic radiation, as taught by Hayashi et al., since by this manner it would successfully anneal the amorphous carbon.

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In re claim 4, Hayashi et al. remedy the deficiency of Friedmann et al. in view of Chou et al. because Hayashi et al. teach that electromagnetic radiation is provided by a lamp (col. 4, lines 48-50).

Allowable Subject Matter

7. Claims 9-18 are allowed.

8. Claims 6-8, 32, 33, 35, 36, 38-41 and 44-46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter:

In re claims 9, 32 and 39, none of the prior art of record teaches or suggests depositing a layer comprising amorphous carbon and a dopant selected from the group consisting of nitrogen, boron, phosphorus, fluorine and combinations thereof on the substrate.

In re claims 6 and 40, none of the prior art of record teaches or suggests removing the amorphous carbon layer from the substrate after the exposing the substrate to electromagnetic radiation.

In re claims 7, 35 and 41, none of the prior art of record teaches or suggests implanting dopant ions into the substrate before the depositing a layer comprising amorphous carbon.

In re claim 38, none of the prior art of record teaches or suggests exposing the substrate to electromagnetic radiation to a temperature between about 1100 °C and about 1410 °C.

Response to Arguments

10. Applicant's arguments filed 10/6/ 2006 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made, as stated above.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-ming Lee whose telephone number is 571-272-1863. The examiner can normally be reached on Monday, Tuesday and Thursday (7:30 ~ 6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Hsien-ming Lee
Primary Examiner
Art Unit 2823

Dec. 22, 2006

HSIEN-MING LEE
PRIMARY EXAMINER

12/22/06